EnergyStar®
Heat Pump Water Heater Opportunities

Harvey M. Sachs, Ph.D.
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Topics

- Introduction to HPWH
- HPWH Savings Potential
- New E* Products
- Incentives
  - Tax Credits
  - Utilities.
- What's Missing from this picture?

Residential Heat Pump Water Heater

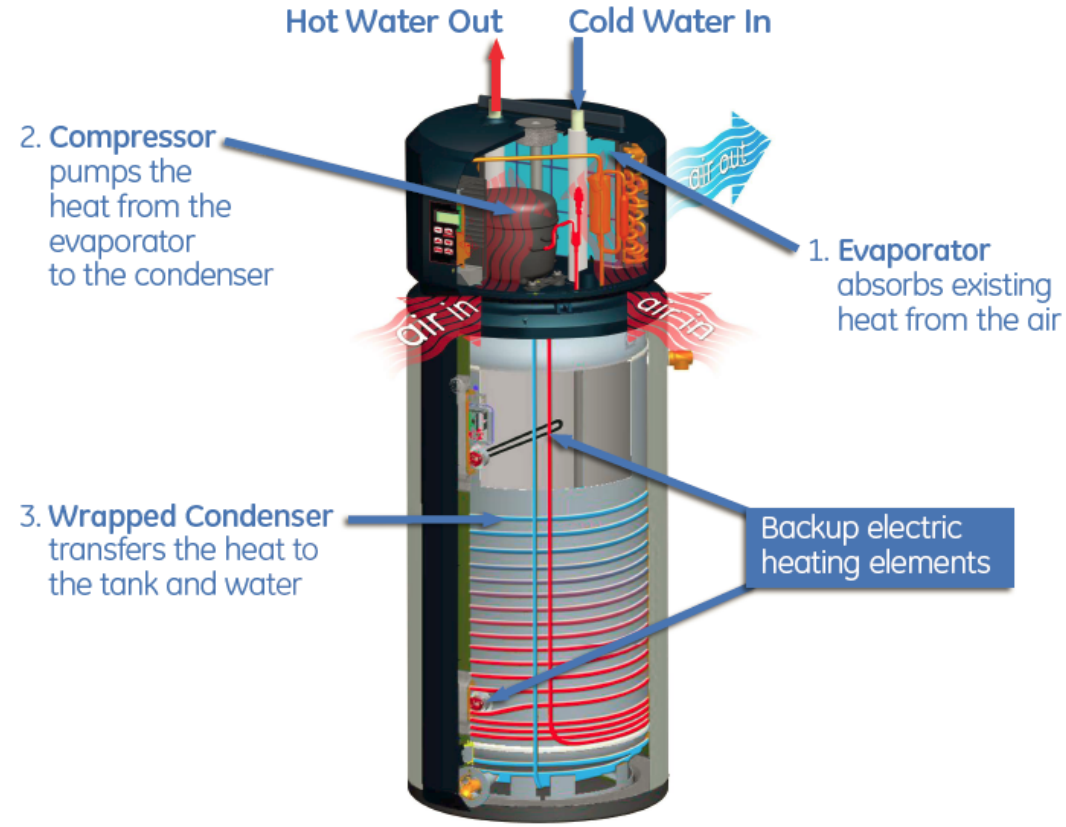
- How does it work?

Self-contained heat pump unit is attached on top of the tank

Absorbs ambient heat from the surrounding air to heat water using HVAC compressor and R134a refrigerant

Modes allow for automatic heat source switching depending upon ambient conditions

How it Works



Operating Modes

- **Heat pump** – uses only extracted heat from the air
- **Standard electric** – uses only resistance heating
- **Hybrid** – heat pump used as primary heating source with standard electric as a back-up

GE Hybrid Features & Benefits

Similar electrical and plumbing connections for easy installation

Height = 60.5"

Diameter= 21.75“

Similar Footprint as Standard Electric 50 Gallon Water Heater

Uses Electric-240 VOLT, 30 AMP Circuit -just like Standard Electric Water Heater

Integrated Digital Electronic Control - easy to adjust operating mode and change temperature

50 Gallon Capacity

Energy Factor of 2.35 Energy Star certified

Temp Settings 100-140F in 1F increments

Saves up to 62% on Water Heating Costs which equates to approximately $320/year for the average homeowner

Same high demand performance and recovery as traditional electric water heater

Rheem

- 50 Gal
- 2.0 EF
- 10-yr warranty
- Integrated touch-pad controls
- 3-mode
  - HP
  - HP w. back-up
  - Resistive only

Rheem HP Water Heater

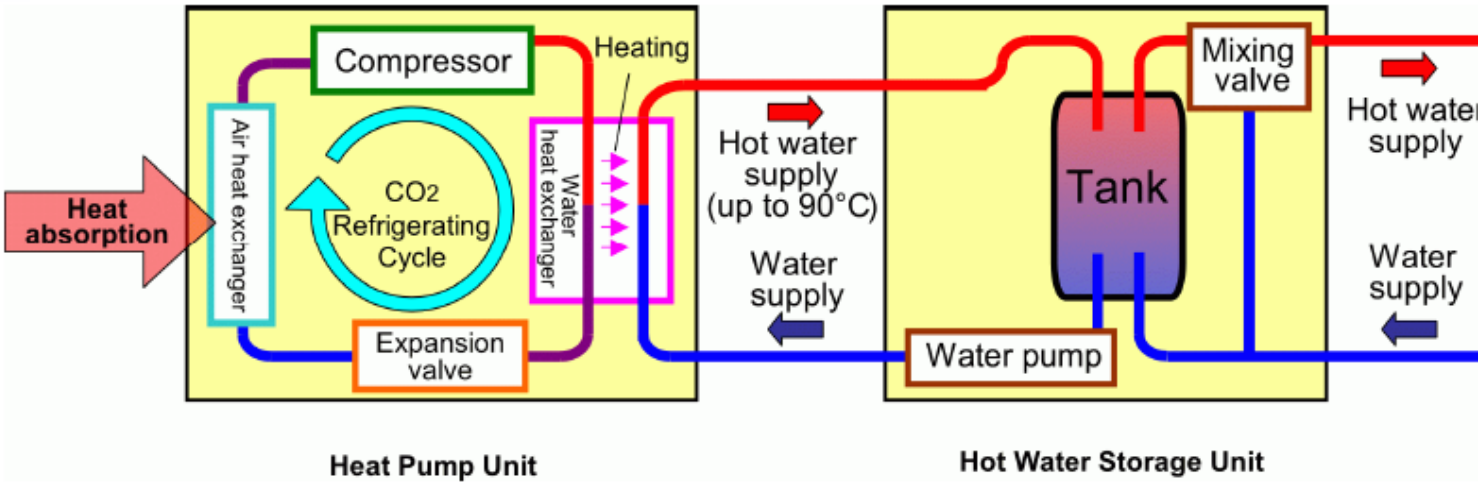
(basketball players for scale) ☺

Rheem HP Water Heater

(basketball players for scale) ☺

75.5” tall x 21” dia

General Description of Eco-cute HPWH



- High heating temperature between heat pump and tank, made possible by using CO_2 as the refrigerant
- Idea is to make and store hot water by using cheap nighttime (off-peak) electricity

Courtesy of Daikin Industries Ltd.

Eco-cute System Specifications, EPRI Installation

Eco-cute System	
Model name	EQ37JFV
Power source	200 Vac, 1-phase, 50/60 Hz
Maximum current	17 A
Circuit breaker rating	20 A
Ambient operating range	14 to 109 °F
Annual heating efficiency factor (JRA4050 standard)	3.2

Eco-cute Manufacturer's Performance Tests (JRA4050 Standard)

Season description	Ambient conditions		Heat pump conditions			System performance		
	Dry bulb temp. (°F)	Wet bulb temp. (°F)	Inlet water temp. (°F)	Outlet water temp. (°F)	Heating capacity (kW)	Current (A)	Power (kW)	COP
Intermediate	60.8	53.6	62.6	149.0	4.5	4.8	0.885	5.1
Summer	77.0	69.8	75.2	149.0	4.5	4.7	0.845	5.3
Winter, high temp outlet	44.6	42.8	48.2	194.0	4.5	7.7	1.500	3.0

Data courtesy of Daikin Industries Ltd.

The Other Approach: Add-On

- Add-on HPWH
- Problems with rating methods
  - Cross-technology miss-fires
  - Hard to measure
  - One-size-fits-all

HPWH Savings Potential

Technology	Energy Factor	kWh/yr Savings (Per Unit!)	$/yr savings
Standard Electric Resistance Storage	0.90	–	–
Best Available Electric Resistance Storage	0.95	235 kWh	$26
ENERGY STAR Qualified Heat Pump Water Heater	**2.0**	**2,662 kWh**	**$295**

Note: assumes average daily consumption of 64.3 gallons of hot water per day (typical of family of four), and utility rate of 11 cents per kWh

Savings Potential

- Installed base of electric water heaters:

  ~40 million units (nationwide)
- 10% displacement of standard storage:
  - 110 billion kWh (site)
  - 1.1 Quads (primary source)
  - $12 billion in consumer utility savings

Regional Considerations

- Can affect HVAC loads
- Regional variation of heating, cooling, and dehumidification, as well as utility rates, affect savings

VEIC Study (2005):

	Boston	Miami	Portland, OR	Los Angeles
Water Heating Savings	$239	$129	$127	$196
Cooling Effect (benefit)	$26	$35	$10	$19
Heating Effect (penalty)	(-$92)	($0)	(-$37)	(-$54)
Net Savings	**$173**	**$164**	**$100**	**$161**

Note: Assumes EF of 1.76; ENERGY STAR requires ≥ 2.0. Assumes heating system as regionally appropriate

Regional Considerations

- In some regions, water heating energy consumption is as large or larger than space heating (Source: RECS WH7 and SH8)

Census Division	Space Heating Energy Consumption (BTU/yr)	Water Heating Energy Consumption (BTU/yr)
New England	85.4	21.5
Mid Atlantic	67.4	22.0
East North Central	62.5	20.9
West North Central	49.1	19.7
South Atlantic	21.2	13.9
East South Central	28.0	16.2
West South Central	17.0	19.1
Mountain	35.2	20.5
Pacific	21.7	21.7

Regional Considerations

- Gas space heating and gas water heating (Source: RECS WH6 and SH7)

Census Division	Space Heating Energy Consumption (TCF/yr)	Water Heating Energy Consumption (TCF/yr)
New England	74	21
Mid Atlantic	65	22
East North Central	67	24
West North Central	54	22
South Atlantic	43	25
East South Central	45	26
West South Central	23	24
Mountain	41	22
Pacific	25	24

Regional Considerations

- Electric space heating and electric water heating (Source: RECS WH6 and SH7)

Census Division	Space Heating Energy Consumption(kWh/yr)	Water Heating Energy Consumption (kWh/yr)
New England	2434	2552
Mid Atlantic	3148	2637
East North Central	3614	2949
West North Central	2964	2931
South Atlantic	1818	2709
East South Central	2627	2964
West South Central	1712	2744
Mountain	1837	2890
Pacific	2074	3057

ENERGYSTAR HPWH

Minimum Energy Factor of 2.0

- Minimum First-Hour Rating requirement of 50 gallons.
- Minimum six-year warranty on the sealed system.
- Compliance with ANSI Z21.10.1/CSA 4.1.

Product Introductions

Company	Availability	Distribution Channels
GE	End of September	Initially through utility bulk purchases; normal wholesale and retail distribution in 2010
Rheem	End of September	Initially through normal wholesale channels only, expanding to retail as possible
A.O. Smith	4th Quarter 2009	All normal wholesale and retail channels
Air Generate	4th Quarter 2009	Wholesale distributor network
Stiebel-Eltron	Currently Available	Wholesale distributor network

Barriers

- Market structure for replacements
  - Small fraction are planned replacements
- Values Proposition too subtle?
  - First cost premium, despite fast payback
  - Dehumidification benefits not quantified
  - Do builders care?
- Are plumbers too conservative?
- Restrictive local rules?

Who Cares: Incentives

- 30% Federal Tax Credit
  - Subject to $1500 cap
  - Includes the cost of installation
  - Good for 2009 and 2010
- ARRA Rebate Funding?
- Leverage these dollars!

Who Cares: Incentives

- Typical Family of Four: $295/year savings (2600+ kWh/yr savings per unit!)

Incentive	Installed Cost	Price Premium	Payback
None	$1800	$1150	3.9 years
Federal Tax Credit	$1260	$610	2.1 years
ARRA Rebate (Example: $100)	$1160	$510	1.7 years

Rating Methods Changes

- 118.2
- The legislated option

Discussion

- This is way overdue
  - Major firms involved
  - Credibility
  - Incentives and urgency
- May it be profitable for all parties
- Credit to EnergyStar for embracing an “emerging” technology

Contact Information

Harvey M. Sachs, Ph.D.

Senior Fellow, ACEEE

202-507-4014

hsachs@aceee.org

www.aceee.org